# The Chemical Age

**A Weekly Journal Devoted to Industrial and Engineering Chemistry**

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# Education for Management

THE spread of learning and the increasing industrialisation throughout the world, coupled with the growing complexity of industrial processes and their reliance upon mechanism, will tend to make education of greater importance as the years pass. This country, being a densely-populated island without any large natural resources, save coal and a few of the commoner minerals such as limestone and salt, must depend for its prosperity upon: (1) the manufacture for export of products requiring a high degree of skill, (2) the invention of new processes or tools which will bring direct or indirect gain, and (3) the development of new industries, some manufacturing goods that can be exported and others manufacturing from home materials at low cost products that would otherwise have to be imported. It is thus evident that education to the *n*th degree is needed in this country, and that if any considerable part of the world also educates its population to the *n*th degree, in this country we must immediately raise our standard to the $(n + 1)$th degree. What should be the quality of this education in the future?

In a specialist community there must be specialisation. Some individuals are good for one type of work while others can be more profitably trained for another. "High learnt niggers ain't much use at rolling logs," says a negro proverb, and the truth of that saying makes it evident that education must be suited to the type of work which the individual proposes to undertake. Moreover, education must be widely adopted as a preparation for many posts for which to-day a man is selected more or less haphazardly on the basis of his reputation, often in quite alien work. In the years before the war there was a surprising vogue in the selection of candidates for higher posts; industries created new specialist posts of considerable importance and quite often filled them with men who were complete strangers to the industry concerned, and who had been doing work of a different character. It cannot be said that the results were satisfactory, though, of course, there were exceptions. To-day, we recognise that a young man can discover through the application of industrial psychology for what type of work he is suited. If combined with this report his own personal predilections are taken into account it is likely that he will not be placed in an unsuitable occupation.

Lord Reith's injunction that the chemical industry should consciously train men for management, an occupation sadly neglected in the past, will not be forgotten. A valuable contribution to the subject of industrial education was made by Mr. John Terrace, himself a technologist and a manager of experience and note, to the Annual Meeting of the Institution of Gas Engineers. Mr. Terrace very rightly distinguishes between "instruction" and "education." Technical education, as we know it to-day, the education of the engineer and the chemist in the fundamentals of their art or science, is "instruction." The individual obtains a knowledge of those principles through which he must design plant, analyse a product, or conduct research. That instruction requires for its proper assimilation a mind of high receptivity and of a high quality. But it is to a great extent a machine-made mind, and it is capable of originality only in so far as it is able to go beyond the barrier of facts with which it is surrounded and to let imagination loose to rove beyond that barrier, though restrained always by a knowledge of technical facts from attempting the impossible.

For management, Dr. Terrace maintains that there must be true education. A foundation of technical facts is good. It is perhaps the very best foundation upon which to base education for management of a technical industry; but it is not by itself enough. Many years ago Emerson laid down some principles of education: "It is this wise mixture of good drill in Latin Grammar with good drill in cricket, boating, and wrestling that is the boast of English education, and of high importance to the matter in hand." Mr. Terrace maintains that the chief official of a business should be educated in the most liberal sense so that he may develop the ability to acquire at will the kind of knowledge found later to be necessary. "We require," he says, "men of bigger vision and greater ability. How are they to be obtained? The suggestion is that youths should be induced to stay longer at school, spending the time after passing examinations of, say, matriculation standard, in the further study of history, English, and a language, with perhaps higher mathematics, and in those later years to enter fully into the corporate life of the school and such literary and debating societies as are available. Then to proceed to a University to take a degree in science, commerce, or even in arts. . . . When at college they should embrace every opportunity provided by the corporate life of associating with their fellow students in philosophical and debating societies and also in sport." All our experience prompts us to agree that while a manager of a works must be highly skilled technically, the manager of the whole business must have education in that wider sense which enables him to recognise that there are values higher than the retort and the steam engine. Pope's dictum that the proper study of mankind is man is hackneyed now; but it is peculiarly true of the higher management, and that presumably is what is behind Mr. Terrace's sound prescription.

# NOTES AND COMMENTS

## Paper Ration for the "C.A."

READERS of THE CHEMICAL AGE will notice a slight change in the appearance of the paper this week. The size of the page is, in fact, a trifle smaller than it used to be. This change has been made necessary by increasing difficulties arising from the drastic rationing of paper. The Paper Controller had, for some months, allowed the proprietors of THE CHEMICAL AGE, and indeed of every other trade and technical journal, to use 33 per cent. of their consumption of paper in the period immediately preceding the war. The ration has now been cut to 25 per cent. Successive orders by the Paper Controller have been loyally observed. They are the result of a policy of curtailing shipments of bulky material, designed for the sole purpose of securing the more effective prosecution of the war. THE CHEMICAL AGE deliberately sets its face now, as it has in the past, against any revolutionary change in the paper or any depreciation of its quality. The proprietors feel that they can be rendering no better service at the present time than by maintaining the high character of THE CHEMICAL AGE essentially unimpaired. The slight change which has been made in the page size makes no breach of any kind with the traditions of the paper, and is at the same time a substantial contribution to the national need for the further restriction of paper consumption.

## Trade with Syria

THE occupation of Syria by British, Australian, and Free French forces marks a happy reversal of a trend that has been unduly marked during the course of the present war, namely, the removal of country after country from the orbit of British trade. The extension of the sterling bloc to Syria opens up a new and important area to British export trade, and the remarkable and excellent way in which the military operations have been carried out, with the absolute minimum of bad feeling on either side, will allow the renewal of trade relations to be started without the friction that normally attends such events. The currency question should present few difficulties: a fixed exchange rate is to be established between the pound sterling and the Syrian franc, and this will, no doubt, be the same rate as applies throughout the Free French Empire. A certain amount depends on the number of French civilians now resident in Syria who may wish to be repatriated, since some of them, no doubt, possess assets of considerable value: but it was, no doubt, partly with this in mind that Mr. Oliver Lyttelton was despatched eastward, and the problems arising should not be difficult of solution. Up to the present, trade between this country and Syria has been of very moderate dimensions, but as Syria is now cut off from her normal principal export market, *i.e.*, France, she will have to turn elsewhere for an outlet. Trade with the United Kingdom is the obvious alternative, and the United States will have yet another reason to thank President Roosevelt for his confidence and foresight in allowing American vessels to sail the Red Sea.

## Scotsmen in Chemistry

AS was remarked at the recent annual meeting of the Society of Chemical Industry, the change of presidents did not involve a change of nationality, since one Scotsman succeeded another, the West of Scotland, in the person of Dr. Cullen, taking over from the East, in the person of Professor Philip. Dr. Cullen, the new president, is a typical exponent of a dictum of Sir Ernest Benn's, expressed in his recent individualistic murmurings (considered elsewhere in these comments); he is one of the Scotsmen who spend a great part of their lives in looking after British trading interests overseas, while their English colleagues are mainly attending to the homeward end of affairs. William Cullen was born in 1867 at Uddingston in Lanarkshire, a couple of miles or so from the birthplace of David Livingstone, and was educated at Hutcheson's Grammar School and the Andersonian College, Glasgow. During a spell in Germany he worked at the School of Mines (the oldest of its kind in the world) at Freiberg in Saxony, and trained as a chemist under Dittmar. Following a period at the explosives works of Nobels and Kynochs, he went to South Africa in 1901, and remained round about the Witwatersrand for 14 years, where his skill as a chemical engineer won him the degree of LL.D. from the University of the Witwatersrand in recognition of his successful fight against silicosis, then the scourge of the Rand mines. Incidentally, he found time to establish the South African Red Cross Society, to command the Imperial Light Horse, and to serve as president of the Chemical, Metallurgical, and Mining Society. Since his return home he has been president of the Institution of Mining and Metallurgy and of the Institution of Chemical Engineers.

## A Plea for the Strenuous Life

THE INDIVIDUALIST BOOKSHOP has done a public service in publishing in booklet form, for the very moderate price of one shilling, the papers written by Sir Ernest Benn for *Truth* under the general rubric *The Murmurings of an Individualist*. Sir Ernest Benn is never afraid to speak his opinion, and he tilts unflinchingly at the numerous and varied abuses which the natural lethargy of the average Englishman has allowed to come into being during the recent years of dependence upon State schemes for this, that, and the other. He is all for the strenuous life, and his most urgent warning reminds us that slavery, whether to the State or to an individual, is far from being always so acutely uncomfortable a condition as it is often represented. On the contrary, slavery, with its utter lack of responsibility, can be a condition of great physical comfort: and though in time of war a measure of slavery to the State is inevitable, it was not by means of a slave mentality that Britain attained her present position in the world. Sir Ernest recalls, with vigorous and topical illustration, that it was men willing to face discomforts and to work hard and long who built the unrivalled British commercial and financial edifice, the foundations of which have lately been sapped by reliance on Government bounty. Of the 25 papers, the one which touches the British manufacturer and trader most nearly is No. 24, "The Word of an Englishman." The Spanish saying, *palabra de inglés*, can be translated as "honour bright": but the crux of the matter is that it is the word of *an Englishman* that counts, not the word of a government. The word of the British Government, it is true, is far more trustworthy than that of any other: but by its very nature a government is incapable of rising to the height of honour open to an individual. Consider merely the attitude of governments to debt. However, the point is that trade cannot be established by agreement between governments: it is the individual trader who must go out and make his contacts, and ensure the solid foundation of trade by his *palabra de inglés*.

## Wholesale Prices in June

THE Board of Trade Index Number for wholesale prices of industrial materials and manufactures for the month of June is 156.1 (1930 = 100): for chemicals and oils the figure is 126.4: for iron and steel 181.2: and for non-ferrous metals 124.1. Compared with the May figures, that for chemicals and oils represents an increase of 0.2 per cent.: and that for iron and steel 0.1 per cent. No appreciable change was recorded for non-ferrous metals. In the past twelve months (that is, since June, 1940) the respective increases are 7.5, 18.7, and a decrease of 0.1 per cent. There were no significant changes in the iron and steel quotations, while in the non-ferrous metals group lead sheet and pipes were about 3 per cent. dearer and the monthly average price of tin 2 per cent. lower. In the chemicals and oils group, the only important change was a rise of about 3 per cent. for paint. The aggregate increase in the price of industrial materials and manufactures since the outbreak of war is 53 per cent., and in comparison with last month the rise is 0.9 per cent.

# Water-Glass: its Composition and Uses

## I.—Notes on Analysis and Determination

by BRUNO SCHWEIG, Ph.D.

THE name of water-glass, with its two components, is easily explained. Ordinary glass can be roughly defined as a double or multiple silicate, with the proviso that one of its metal bases must be an alkali metal (or several of them), whereas the other metal or metals belong to the alkaline earth group, sometimes also to another. Hence, in ordinary glass, there are, at least, two metals of different groups, one always being an alkali, so that the simplest formula for a regular glass is, for instance, $Na_2Ca(SiO_3)_2$ or $Na_2O, CaO, 2SiO_2$. All glasses of this type are practically insoluble in water. By contrast, water-glass contains only a metal of the alkali group (or several of them), its simplest form being therefore $Na_2SiO_3$, or $Na_2O, SiO_2$. These alkali-silicates are soluble in water. The similarity in composition and manufacture as well as original appearance accounts for the name "glass," while its solubility in water and the fact that it is nearly exclusively made use of in its liquid form induced J. N. von Fuchs to call it "water"-glass. The name applies equally to the solid form and to the aqueous solution.

The formula $Na_2O, SiO_2$, represents, however, only one special case of water-glass. The general formula is $Me_2O, nSiO_2$, "Me" standing for one or several alkali metals, and, "n" indicating the molecular ratio of the silicic acid to the alkali. It is tempting to assume that "n" must be a whole number, as silicates of the formulæ $Na_2SiO_3$, $Na_2Si_2O_5$, $Na_2Si_3O_7$, $Na_2Si_4O_9$, etc., are known. However, it was found that the properties of the alkali-silicate fusions change constantly and evenly with the composition, thereby not indicating any special chemical individuality. Besides, it is not certain what proportion of real silicates, of free silicic acid, and perhaps also of free alkali, is contained in the molten compounds at different temperatures. Therefore, the molecular ratio "n" may be, and mostly is, a fraction, varying, for instance, for sodium water-glass from 1.2 to 4 corresponding to the formulas $Na_2O, 1.2\ SiO_2$ to $Na_2O, 4SiO_2$. The connection between the molecular ratio of silicic acid to alkali and the composition of pure sodium water-glasses is easily calculated and may be seen from Fig. 1.

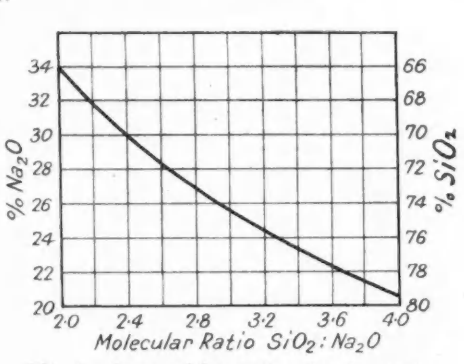


**Fig. 1. Composition and molecular ratio of solid water-glass**

Attention has to be paid to the fact that the molecular weights of silicic acid (60.06) and of sodium oxide (62.00) are close together and that therefore the molecular ratio differs only by 3.1 per cent. from the weight ratio of the two. From practical considerations, manufacturers and consumers have agreed to confine themselves to a few commercial brands and not to produce or sell water-glass of every possible ratio. It is the custom to speak of sulphate or soda water-glass, according to the raw materials. But these water-glasses, when properly fused, are identical.

The colour of the solid water-glass varies to a great extent. The glasses can be green, yellow, or not tinted at all. In Table 1 some properties are given. But all of them, including the colours, are only indications of the properties of the average products. For instance, it is commercial practice to choose a higher silica ratio for the water-glass on sale in summer than in winter in order to keep the viscosity as stable as possible. Impurities, mostly from the furnace or the fuel, may amount to 2 per cent. and comprise $Fe_2O_3$, $Al_2O_3$, CaO, MgO and sand or fireclay.

TABLE 1
TRADE BRANDS OF SOLID WATER-GLASS

| Name | Colour | Mol. Ratio | Composition, per cent. | | |
|---|---|---|---|---|---|
| | | | $SiO_2$ | $Na_2O$ | Impurities |
| Neutral sulphate-glass | Blue-green .. | 3.2—3.5 | 75 | 23 | Up to 2 |
| Neutral soda glass .. | Light yellow | 3.2—3.5 | 76 | 23 | Up to 1 |
| Alkaline glass | Brown .. | 2.0—2.2 | 66 | 32 | Up to 2 |
| Potassium water-glass | Light brown | 3.5—3.8 | 70 | ($K_2O$) 29 | Up to 1 |

Liquid water-glasses are also mostly sold in certain grades of strength. Variations can be easily obtained by mixing different brands. Table 2 shows the varieties of water-glass mostly used in the trade. The first variety in the table is the most important, and constitutes more than 90 per cent. of all water-glass in use. Liquid water-glass is classified, as a rule, according to its density, measured in degrees Baumé, and to its molecular ratio of silicic acid to alkali.

TABLE 2
TRADE BRANDS OF LIQUID WATER-GLASS

| No. | Name | Mol. Ratio | Composition $SiO_2$ % | $Na_2O$ % | $H_2O$ % | Solid glass in solution % | Density | Viscosity at 20° C. Water = 1 |
|---|---|---|---|---|---|---|---|---|
| 1 | Sodium water-glass 36/38° Bé. | 3.3 | 26.5 | 7.9 | 65.6 | 34.4 | 1.34 | 20–200 |
| 2 | 40/42° | 3.3 | 29.0 | 8.9 | 62.1 | 37.9 | 1.40 | 40–400 |
| 3 | 50° | 2.6 | 35.0 | 13.5 | 51.5 | 48.5 | 1.53 | 200–2,000 |
| 4 | 60° | 2.1 | 37.0 | 18.0 | 45.0 | 55.0 | 1.71 | 1000–10,000 |
| 5 | 70° | 1.6 | 37.0 | 23.0 | 40.0 | 60.0 | 1.92 | 8000–80,000 |
| 6 | Potassium water glass 31° | 3.6 | 21.0 | $K_2O$ 8.6 | 70.4 | 29.6 | 1.27 | 10–200 |
| 7 | Water-glass crystallised | 1.0 | 21.0 | 21.0 | 58.0 | 42.0 | 1.55 | 200–500* |

* When molten.

The impurities of technical water-glasses, both solid and liquid, are very small. Sometimes some sodium sulphide or potassium sulphide occurs, imparting an unpleasant odour. The sulphur most probably comes from the heating gases and can be either avoided by melting well in an oxidising flame, or removed from the solutions by adding hydrogen peroxide or precipitating it with a suitable metal salt.

Water-glass, consisting, if pure, of only two constituents, offers no special difficulties to the analyst. The main, and often sole, object of analysis here is to establish the ratio of $SiO_2$ to $Na_2O$ or $K_2O$. Sometimes the impurities may have to be determined by ordinary analytical methods. They usually consist, as we saw, of $Fe_2O_3$, $Al_2O_3$, CaO, MgO, and some residue insoluble in hydrochloric acid, totalling about 2 per cent. The impurities present in solid water-glass hardly ever occur in the solution, being retained by the filter or as precipitate at the bottom. This fact simplifies still further the analysis of the solution.

Solid water-glass has, of course, to be dissolved before it can be analysed. Sometimes, especially with very basic silicate, the water-glass, after being crushed to a fine powder, dissolves in hot water and can immediately be titrated after dilution. More often it is readily decomposed by hydrochloric acid, forming silicic acid and alkali

chloride. Usually, however, the solid water-glasses have to be made easily soluble by fusing together 1 part of water-glass with 4 to 8 parts of sodium carbonate in a platinum crucible. The mixture is then dissolved in hot dilute hydrochloric acid.

## The Nature of Silicic Acid

Silicic acid at ordinary temperatures is one of the weakest of the inorganic acids. It acts, however, as a powerful acid anhydride at very high temperatures, combining with the bases of many metallic oxides to form more or less fusible silicates. When silica is melted with sodium carbonate, carbon dioxide is expelled with effervescence:

$$Na_2CO_3 + SiO_2 \rightarrow Na_2SiO_3 + CO_2.$$

The powerful acid character of silica at high temperature turns on the fact that most of the acid anhydrides volatilise at much lower temperature, and consequently, as soon as a very little is displaced, the volatile anhydride passes off and ceases to compete with the silica for the base. At low temperature sulphur trioxide or carbon dioxide rapidly displace silica when competing under equal conditions. Our equation is consequently reversed which also explains the reaction in our crucible:

$$Na_2SiO_3 + CO_2 \rightarrow Na_2CO_3 + SiO_2.$$

The gravimetric determination of the silicic acid present in water-glass is somewhat complicated and lengthy, whether starting from an original solution of water-glass or from the solution of the fused mixture in dilute hydrochloric acid. The principle is: (1) to precipitate the silicic acid with hydrochloric acid according to the equation $Na_2SiO_3 + 2HCl = SiO_2 + 2NaCl + H_2O$; (2) to dehydrate the silica and make it insoluble by gently heating and to wash off the soluble chlorides; (3) to complete the dehydration and to convert the precipitate into anhydrous silicon dioxide by igniting at a very high temperature; (4) to weigh it in this form. Sometimes another operation is added, when it is feared that an unusually high proportion of impurities is precipitated with the silicic acid. In this case the silica is treated with hydrofluoric and sulphuric acid to volatilise it as silicon tetrafluoride: $SiO_2 + 4HF = SiF_4 + 2H_2O$.

The excess of acid is evaporated and the residue ignited to the oxide. The loss in weight of the precipitate represents pure silica.

For the dehydration hot concentrated sulphuric acid or perchloric acid are effective agents. Dehydration with perchloric acid can be completed more quickly than evaporation to dryness, and the perchlorates are all soluble.

The usual procedure for silica determination may be recorded. Weigh out 1 gm. of the sample into a 150 c.c. beaker, add 50 c.c. of water and 25 c.c. of concentrated hydrochloric acid. Keep it hot but avoid boiling. As the solution stands, gelatinous silicic acid usually separates. For dehydration, place the beaker on a low-temperature hot plate to evaporate the solution to dryness at a temperature not exceeding 120° C. The residue must be thoroughly dry. Cool, add 5 c.c. of concentrated hydrochloric acid, and warm gently to dissolve the basic salts. Add 20 c.c. of water and rub the precipitate loose with a rubber-tipped rod. Evaporate the solution again and dehydrate as before. During this second evaporation the silica is in a granular instead of a gelatinous form, and includes fewer impurities. It is also much more slowly soluble in acid.

After the second dehydration, the separation of the silica from the chlorides takes place. Treat the residue as before with 5 c.c. of concentrated hydrochloric acid, and heat until basic salts are dissolved. Dilute the solution with 25 c.c. of water and heat for 10-15 minutes or until everything but the silica is dissolved. Rub the precipitate loose, filter, and wash it 10 times with dilute hydrochloric acid (1:100), then with water until the washings are free from acid. The diluted acid is used because its hydrogen ion tends to coagulate, or prevent dispersion of the negative colloid silica. Fold up the damp filter, and set it aside until a second recovery of silica is completed. As a little silica always remains in the filtrate, evaporate the filtrate and the washings to dryness and dehydrate as before. The action of the hydrochloric acid, both before and after dilution, should not be excessively prolonged, otherwise some of the silica dissolves.

For the completion of the dehydration ignition is necessary, as even after drying at 110-120° C. the silica still contains 3 or 4 per cent. water. Therefore, transfer, without drying, both precipitates to a porcelain or, preferably a platinum crucible. The crucible has to be ignited and weighed without the lid. Char the paper, then burn off the carbon over a low flame as usual. Take care that none of the fine powder is blown away. When the precipitate is white, cover the crucible, place it preferably on a triangle inside a clay cylinder to increase the temperature, and heat for one hour at the full temperature of the Meker burner to complete the dehydration. Weigh the silica and repeat these ignitions until the weight is constant. As a rule, this procedure is sufficient for the determination of the silica content in water-glass.

If a comparatively large amount of impurities was present at the start, the ignition must take place in a platinum crucible and the procedure should be supplemented thus. Moisten the ignited powder with water, add two drops of concentrated sulphuric acid and about 5 c.c. of hydrofluoric acid. Evaporate the acid slowly under a hood, heat the crucible to a bright red heat for 15 minutes to convert the sulphates into oxides, and weigh the residue. The loss in weight is the weight of pure silica.

A quick gravimetric analysis for silicic acid said to be reliable enough for a rough test, though not yet fully proved, is as follows: 2 gm. of water-glass, together with 2 gm. of ammonium chloride and 10 c.c. hydrochloric acid are heated on the water-bath for 10 minutes, 50 c.c. of hot water are added and quickly filtered. The precipitate is washed with hot dilute hydrochloric acid, burnt to ash, ignited and weighed. This procedure, it is claimed, yields quite good results for contents of 25 to 63 per cent. silicic acid.

## Colorimetric Analysis

Several rapid yet reasonably reliable methods of analysing the silicic acid content by determining it colorimetrically have been described. A brief outline of one of them is as follows: The neutral or slightly acid solution of 5 per cent. ammonium molybdate solution, and 5 to 6 drops of concentrated hydrochloric acid are added. After heating to 60°-70° C. for 5 minutes and subsequent cooling, 10 c.c. of a 0.5 per cent. α-naphthol solution in 10 per cent. NaOH are added. Then the silicic acid content is determined colorimetrically with a standard solution.

The determination of the alkali is comparatively simple. With solid water-glass the silicic acid is volatilised by treatment with hydrofluoric acid and the basic metals of the residue analysed. For the purpose of a quick analysis of the alkali in solid water-glass the following procedure can be taken. The water-glass is well pulverised and treated in a platinum crucible with hydrofluoric and sulphuric acid. The residue, when ignited, consists almost solely of sulphate. If the sulphates amount to "r" per cent. of the solid water-glass, then the molecular ratio "n" of pure sodium water-glass is:

$$n = \frac{236.5}{r - 1.031}$$

With liquid water-glass the determination of the alkali is still easier, because of the great hydrolysation of the alkali silicates. As silicic acid is such a weak acid that it does not affect methyl-orange, titration with normal acids, for instance, with N/5 hydrochloric acid, is possible. It is, however, necessary to dilute before adding the acid, to prevent the precipitation of silicic acid, as the precipitate may retain some alkali. Potassium can be separated from sodium by precipitating it as perchlorate after the volatilisation of the silica with hydrofluoric acid. The method of precipitating sodium with zinc-uranyl acetate has also been developed recently. A good description of the procedure was given at the 41st annual meeting of the American Ceramic Society at Chicago, by P. A. Webster and A. K. Lyle in a paper on "Short Methods for Chemical Analysis of Glass."

The composition of water-glass solution is often calculated by its density. This, in combination with the easily determined amount of alkali, is a means of finding the molecular ratio and, consequently, the content of silica.

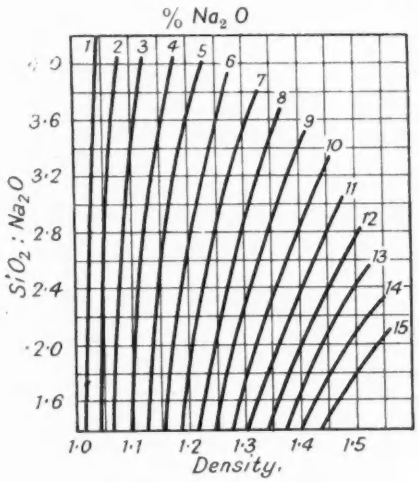


**Fig. 2. Curves of equal $Na_2O$ content in relation to molecular ratio and density for quick analysis of liquid water-glass**

Instead of calculating the molecular ratio from density and alkali content, curves such as those in Fig. 2 may be used.

The relation of density (specific gravity) to molecular and weight ratios, and to the percentage of solid in a solution of sodium water-glass can be seen from the adjoining table.

TABLE 3.

| Sp. gr. | Mol. ratio $\frac{SiO_2}{Na_2O}$ | Weight ratio $\frac{SiO_2}{Na_2O}$ | Per cent. solid in solution |
|---|---|---|---|
| 1.235 | 4.2 | 4.06 | 26.8 |
| 1.325 | 3.8 | 3.68 | 33.4 |
| 1.375 | 3.0 | 2.92 | 35.5 |
| 1.39 | 3.3 | 3.21 | 38.4 |
| 1.42 | 2.9 | 2.82 | 44.5 |
| 1.56 | 2.5 | 2.38 | 46.7 |
| 1.6 | 2.0 | 1.95 | 48.7 |
| 1.7 | 2.0 | 1.95 | 54.5 |

Composition of some Commercial Grades of Sodium Water-glass

*(To be continued.)*

# Auxin in Fertiliser

## Fixation of Plant Hormone

A SUCCESSFUL method of incorporating the plant-growth hormone, auxin, into the soil, is claimed by Lionel Weil, of Goldsboro, N.C., in a recent U.S. patent covering a new fertiliser of his invention. Plant hormones are normally so easily dissipated in the soil that attempts to stabilise them have not hitherto been successful; but Mr. Weil finds that when the hormone is properly introduced into his fertiliser it is "fixed." Of chemical modifications of auxin he finds indole-butyric and naphthalene-acetic acid best suited to his purpose. He mixes such fibrous stuff as peanut meal, ground peanut shells, cotton-seed meal, soya-bean meal, ground tobacco stems, fish meal, blood tankage, castor pomace or peat with the growth-producing hormone in a solution of alcohol or glycerine. The mixture is dried and added to any commercial fertiliser which contains the usual mineral salts.

# Fire-Proofing Wood

## Pastes and Powders Available

THE President of the Building Industries National Council has pointed out that the Government has gone to considerable expense in testing preparations which will retard the firing of timber by as much as 20 to 25 minutes. He has also expressed the opinion that the extensive use of such products might have avoided millions of pounds' worth of damage and much dislocation of business. In view of these remarks and of the fact that comparatively few firms seem yet to have used these preparations, the Industrial Accident Prevention Bulletin (1941, *9*, 96, p. 28) draws attention to some facts already published. A number of pastes and powders are obtainable which can be used to render woodwork resistant to fire. One firm, for example, has produced a powder which, when mixed with water to form a paste, appears to be extremely effective.

Two varieties are being made. One, when made into a paste and spread on 1 in. floor boards is sufficiently effective to safeguard the floor from small incendiary bombs. The other is intended to be applied to a thickness of ¼ in., and as it sets hard it not only puts up a measure of resistance to penetration, but is an effective barrier to the thermal effect of bombs. Both these powders, though intended primarily for A.R.P. purposes, should be found of service in industries where there is a severe fire hazard. The cost of coating with the first mentioned paste works out at approximately 4d. per square yard.

### Synthetic Resin Coatings

Meanwhile the Forest Products Laboratory at Madison, Wisconsin, has been making tests of fire-resistant coatings with synthetic resin bases, chiefly of two types of preparation—dicyandiamide-formaldehyde and, especially, urea-acetaldehyde-formaldehyde resins (*News Ed.*, 1941, *19*, 11, p. 626). Coatings of these resins, to which either phosphoric acid or ammonium phosphate has been added, give exceptionally good protection to wood. Protection is apparently due to the frothy char produced by the intumescence of the resin, which serves to insulate the wood, and to the presence of the phosphate, which makes the char difficult to burn.

These synthetic resin coatings were, however, found to be deficient in certain other properties desirable in a good paint or varnish covering. Dicyandiamide-formaldehyde resins containing monoammonium phosphate, applied at the rate of 30 gm./sq. ft. showed remarkably good fire-resistance, but very poor moisture-resistance. Tackiness and even dripping of the coating occurred on exposure to a relative humidity of 90 per cent. or more.

Tests made on a few urea-formaldehyde and ethylidene urea-formaldehyde resins to which monoammonium phosphate was added showed them to have good moisture resistance and excellent fire retardance, although not so good as the best dicyandiamide preparations. Their weaknesses were lack of stability of the syrup and brittleness and checking of the coating. Combinations of the dicyandiamide and the urea preparations produced no better results, moisture-resistance being uniformly poor.

In an endeavour to improve the stability and minimise the brittleness of the urea coatings, a study was made of the effect of modifying some of the conditions of the preparation of the resins, and of the presence of additional materials. In the first instance, the large number of variables entering into the preparation of ethylidene urea-formaldehyde resins made it difficult to determine exactly what effect any given change had on the finished product. From the second study a few general conclusions emerged. Ethylene chlorhydrin was found to be a most effective material in preventing gelling: the quantity used varied with the composition of the syrup, but the range was ordinarily between 20 and 40 per cent. of the combined weight of urea and formaldehyde. Plasticisers added with the aim of producing more flexible coatings were not satisfactory, but phenol appeared to improve the moisture-resistance of the coating.

# Notes from Works Safety Jottings

## The Functions of a Process Safety Department

by JOHN CREEVEY

IF mechanical hazards could be eliminated entirely, about eighty per cent. of serious injuries in chemical and allied works would be avoided. Some of the larger chemical concerns have endeavoured to bring about this desirable state of affairs by setting up a special safety department which seeks the total elimination of accidents by inspecting and testing all machinery and equipment at intervals during usage, as well as prior to and at the time of installation. In other words, this special process safety department originates and supervises all inspection routine, and its work is allowed to go on unhindered by other aspects of safety practice in the works.

* * *

The establishment of this process safety department does nothing to relieve employees of their individual responsibility for the safe operation of plant and equipment; neither does it eliminate the work of the men concerned with maintenance and repairs. Its service is entirely administrative. As part of its work it establishes a system for the periodical inspection and testing of all machinery, equipment, and safety devices, and it arranges for a record of all tests, inspections, and repairs by providing suitable report sheets which are subsequently analysed and have facts incorporated in a record system for future reference. The department also circulates information to those in charge of plant throughout the works, so that they can become acquainted with progress in safety matters and, in particular, with such facts as concern the condition of the plant and equipment in their hands.

* * *

Apart from this general supervision of inspection, recording, and reporting, the process safety department sets out to make inspection and testing as efficient as possible by providing proper tools, instruments, and other necessary equipment, and by actual supervision of the work. It correlates corrosion rates and estimates the life of different classes of equipment, so acquiring experience in recommending replacement before equipment actually fails in service. Safe operating pressures are standardised; causes of accidents are investigated independently and reported upon; alterations in inspection routine are made where experience indicates the need. The department studies the design of new equipment and plant lay-out, and makes its own suggestions to eliminate any repetition of conditions which, in past experience in the works or according to reports from outside sources, have been found to be hazardous.

* * *

Functioning with a proper sense of proportion, such a process safety department helps to keep chemical plant perpetually new by timely replacement of defective parts. In doing this the department simultaneously reduces most forms of accident, apart, of course, from those due to sheer carelessness by persons operating the plant. When inspection shows that particular equipment is no longer safe for the operating conditions to which it is subjected, the department may be able to suggest further use under less severe conditions without hazards, or as the alternative it authorises complete removal from service.

* * *

The reports which are circulated as one of the activities of a process safety department do much to increase all-round plant efficiency; they provide means of informing plant personnel upon such questions as conditions arising in service and consequent limitations of use for the different classes of equipment. In many cases the circulation of a report will yield new data to supplement that purposely sought by questionnaire or taken from report sheets, and some of these unsolicited data may be valuable when new installations of plant are contemplated or the standard design of makers of plant is under consideration for purchase.

* * *

No matter how experienced we are as individuals, there is always scope for increasing our store of knowledge in the light of the experience of others. This desirable interchange of information should pervade all departments in the works, and means to facilitate it should be provided. Any desire on the part of employees to know more about the processes carried on in plant which they assist in operating may be conveniently fostered from the aspect of attaining greater freedom from accidents. Just how much information may be divulged in the case of certain processes will depend upon the nature of the process, but it should be remembered that there is always something that may be said for the purpose of creating interest in a man's work, no matter how secret a process may be in the eyes of the manufacturer of chemical or allied products. The man who is permitted detailed knowledge of the work he is doing is not likely to develop into a mechanical robot with complete blindness to everything outside the performance of his set duties.

* * *

Short talks on safety to works personnel should be arranged at convenient intervals where the number employed can justify such a course. The time occupied will find its due place on the asset side of the balance sheet for production. For a small number of employees ways and means may be found to pass on "safety talks" in the form of leaflets obtained from recognised sources such as the Royal Society for the Prevention of Accidents, or the National Safety Council operating in the United States. Even so, at some times in the course of a year it may be found convenient to call the works personnel together for such talks as are advocated where there is a large number of employees and production will not be hindered as a consequence. Literature on matters of working safely, as well as articles cut from trade journals, can be filed in accessible manner somewhere in the works, employees being given opportunity to read them, and advised to do so. In addition, such posters as are obtainable should be displayed at a recognised place near the works entrance and in canteens or mess rooms. The unfortunate occurrence of a serious accident can be hushed up only to the detriment of all employed at the works; its cause and result should be communicated in proper manner to all employees—in the form of a typewritten circular reproduced in sufficient number upon a duplicating machine.

# The China Clay Industry

### Current Shipping Difficulties

THE china clay industry of S.W. England, in order to meet the ever-increasing difficulties of war-time china clay and china stone production, have been considering the concentration scheme suggested by the Government and the Ministry of Labour. Though nothing definite has been arrived at, up to going to press, it is understood that the fixing of a minimum number of producing units cannot long be delayed, and if the industry does not adopt the Government's suggestion by negotiation, it is feared that compulsory powers will be resorted to. Since May, 1940, shipping has been extremely difficult, and influential deputations from the industry to the Ministry of Shipping have failed to improve matters without impeding the war machinery. Markets in America, Canada, India, and even on the Continent for large quantities of china clay must wait for the return of better transport conditions.

# Silver Coatings on Non-Metallic Surfaces*

## Their Application to Plastic Materials

ALTHOUGH the fact that glass may be silvered by simple immersion is well known, it does not appear to be so generally realised that the process of silvering by immersion can be carried out on non-metallic surfaces other than glass, including mica, celluloid, and plastic materials generally. This fact opens up a range of possibilities in the field of electro-metallising non-metallic surfaces, as an alternative to the use of graphite or of bronze powder.

It is not suggested that silvering is likely to displace the older methods. Considerations of cost would no doubt play an important part. On the other hand there may be occasions where silvering as a preliminary to electro-metallising would offer clear advantages. There are two possible advantages in the use of silvering. The first is that the silver deposit covers the whole of a given surface however intricate the shape, with a film of reasonably uniform thickness, so that electrical contact is established all over the surface to be subsequently electroplated. A second advantage is that the extreme, but known, thinness of the silver film makes it possible to use it for the subsequent electro-deposition of other metals in accurately known thickness.

The extremely rapid development of moulded plastics in recent years suggests more general possibilities in the direction of electro-metallisation. Ideas on this subject are, of course, at the moment completely speculative, but it seems of interest to consider possible relative advantages of a metallised moulded plastic as against, say, a plated zinc-base die-casting.

The three standard methods of immersion silvering have been thoroughly tested and should give excellent results with non-metallic substances, if the instructions are carefully followed..

### Three Practical Formulæ

The three formulæ required for ordinary use and application (here given in a somewhat simplified form) are: (1) The Cane Sugar Formula; (2) The Formaldehyde Formula; and (3) The Rochelle Salt Formula. In each case the same general procedure is recommended.

The immersion silvering of a non-metallic surface is totally different in principle from the immersion silvering of a metallic surface. With a metal, displacement of silver from one of its salts by the metal being silvered takes place at the surface, and in many cases surface alloy formation occurs to a greater or lesser extent. With a non-metallic surface, an ammoniacal solution of a silver salt is chemically reduced to metal in the solution by a suitable reducing agent, and the silver so produced deposits on the surface. It follows from this that the adhesion of the silver deposits to the non-metallic surface will not be expected to be so strong as to a basis metal. Nevertheless, with a suitably prepared surface, the strength of adhesion of silver to such surfaces is surprisingly high.

The cleaning and removal of grease from the non-metallic surface prior to silvering are of the first importance, as the slightest trace of grease gives rise to a defective deposit. Methods of cleaning which are available vary with the material, and, obviously, electrolytic cleaners cannot be applied. Solvent degreasing, effective with glass, porcelain, and mica, cannot safely be used with celluloid or plastics generally on account of solvent action. Thorough cleaning and scouring with soap and warm water or weak alkali solution is suitable for these materials, followed by liberal rinsing with water. Scouring with whiting and water is also useful. Nitric acid is frequently recommended for the preliminary cleaning of glass surfaces.

In order to obtain good results it is essential to treat the clean surface of the material, prior to silvering, with a priming solution consisting of stannous chloride (tin protochloride). It cannot be too strongly emphasised that the omission of this preliminary treatment may lead to complete failure to obtain good results. The recommended concentration of the priming solution varies, but a 5-10 per cent. solution of the stannous chloride has been found to give excellent results.

### Priming

The method of application of the priming solution is either by simple immersion, followed by very thorough rinsing, or by gentle swabbing with cotton wool soaked in the solution. After rinsing, the article is immediately transferred to the silvering bath. It is essential to rinse away any adhering stannous chloride solution, otherwise the subsequent silver deposit is liable to be mottled in appearance. There need be no fear of removing all the stannous chloride by too thorough rinsing. Results indicate that this is strongly adsorbed at the non-metallic surface.

The mode of operation of the stannous chloride has been variously interpreted. There is no doubt that it has a double function, viz., of ensuring a good silver deposit and also good adherence, and it seems most reasonable to suppose that the true action of the priming agent is to initiate the deposition of the silver on the surface by the production of nuclei of silver particles through initial reduction by the adsorbed layer of stannous chloride, and to increase adhesion through the adsorption forces operating at the surface.

The silver deposit tends to form equally on the containing vessel, and any means of attracting the silver to the article being silvered will increase the efficiency of the process. Several formulæ recommend warming the article to be silvered to a temperature slightly above that of the solution, immediately prior to silvering, *e.g.*, by a final rinse in warm water. This also appears to serve the same object, *i.e.*, of accelerating the silvering process at the warmer surface of the article, so tending to promote deposition on the article in preference to the container.

The preparation of the ammoniacal silver solution follows the same general course for all three formulæ, but the formaldehyde formula omits the treatment with potassium hydroxide. To 200 c.c. of the solution of silver nitrate, add the stock ammonium hydroxide solution drop by drop, with constant stirring, until the yellowish brown precipitate of silver hydroxide just redissolves. Add 10 c.c. of the stock solution of potassium hydroxide. Precipitation will again occur, a dark brown precipitate being formed. The ammonium hydroxide solution is again added, drop by drop, with constant stirring, until the precipitate just redissolves, giving a clear solution. Any excess of ammonium hydroxide is to be avoided. The reducing agent is then added, the solutions well mixed and the article to be silvered immersed. It is important to keep the article in motion throughout the silvering. The silvering will be complete after 5—10 minutes. No advantage is gained in most cases by immersion for more than 15 minutes.

The cane sugar formula, often known as the Brashear Formula (1884), has been generally adopted for the silvering of mirrors for astronomical telescopes. The formula given below gives excellent results, using a cold solution, with glass and other non-metallic materials. The best results are obtained at 70°—80° F. The following solutions must be prepared:—

*Stock Solution A* (*Reducing Solution*): 100 grams cane sugar (granulated sugar or loaf sugar, or sugar candy); 5 c.c. nitric acid (sp. gr. 1.22); 200 c.c. alcohol. Make up to 1 litre with water. This solution improves with keeping.

*Stock Solution B*: 10 gm. silver nitrate per litre of water.

* Adapted from a paper read by J. R. I. Hepburn before the Electrodepositors' Technical Society, London, on May 19, 1941. —(*J. Electrodepos. Tech. Soc.*, 1941, *17*, 1-10.)

*Stock Solution C*: 200 c.c. strong ammonia solution (0.880 sp. gr.) diluted to 1 litre. *Stock Solution D*: 10 gm. potassium hydroxide dissolved in 100 c.c. water. For use, 10 c.c. of solution A are added to each 200 c.c. of solution B after preparation of the ammoniacal solution as described above.

For the formaldehyde formula the following stock solutions are required:—*Solution A* (*Reducing Solution*): Dilute 50 c.c. of formalin solution (40% formaldehyde) to 1 litre. *Solution B* and *Solution C*, as in the cane sugar formula. For use, add 10 c.c. of solution A to each 100 c.c. of the silver nitrate solution, after preparation of the ammoniacal, solution as described above. Note that potassium hydroxide is omitted in this case.

The Rochelle salt formula requires the following stock solutions:—*Solution A* (*Reducing Solution*): 100 gm. of Rochelle salt dissolved in water and made up to 1 litre *Solutions B, C* and *D* as in the cane sugar formula. For use, add 20 c.c. of solution A to each 100 c.c. of the silver nitrate solution, after preparation of the ammoniacal solution as described above.

Although the Rochelle salt formula is usually recommended for silvering in hot solutions, it will be found that good results are obtained with cold solutions, provided that the procedure already described for priming is followed. If the stannous chloride priming is omitted in this case, no silvering occurs in this solution in the cold. Compared with electrodeposition processes, or silvering of metallic surfaces, the deposition of silver coatings on non-metallic surfaces must be regarded as relatively uneconomic. In most cases much more silver is precipitated during the process than is deposited on the surface. This may be illustrated by data taken from an experiment, in which a silver deposit weighing 0.0040 gm. was made on glass from a solution originally containing 0.32 gm. silver as silver nitrate. This experiment indicates that one-eightieth of the original silver was deposited on the article. The remaining silver was either deposited in the wall of the containing vessel (a relatively small amount) or deposited as a dark brown precipitate.

The obvious course would appear to be either to use a much more dilute solution or to recover the silver from the residues. The disadvantage of using dilute solutions is the slowness of the silvering process. Experiments by Silverman and Howe show that, using a solution containing 6 gm./litre of silver nitrate, under suitable conditions, 20 per cent. of the silver is deposited in 40 minutes on the surface. If silver is to be recovered from the solution, this must be as silver chloride. The residue in the silvering bath is dissolved in nitric acid, and silver chloride precipitated by the addition of sodium chloride solution. The black precipitate remaining after silvering is explosive when dry, and therefore no attempt should be made to recover the silver in this form.

# Chemical Matters in Parliament

## Potato Processing Factories

IN the House of Commons last week, Major Lloyd George, Parliamentary Secretary to the Ministry of Food, in a written reply to Mr. David Quibell, stated that it was hoped the sixth potato processing factory to be erected in this country would be ready by the end of October. The factory is to be established in North-East England. Major Lloyd George added that others had been completed, and that more to deal with the 1941-42 potato surplus were to be erected in Northern Ireland.

The potato processing factories manufacture animal feeding stuffs from the surplus crops. Mr. Quibell has long been pressing the Government to extend this manufacture to potato flour for the national loaf on the lines of the American process, which is claimed to be a great improvement on the potato flour used in bread during the last war. According to Mr. Quibell, the yield per acre from potatoes for flour is greater than the yield from wheat.

# Molybdenum in the Chemical Industries

## Production of Pigments

THE metallurgical uses of molybdenum, as an alloy with either steel or cast iron, are well known, and molybdenum tool steel was in use as long ago as 1899; but its applications to the more strictly chemical industries are of more recent development, dating back scarcely a decade. This metal shows the usual trend that follows chemical research—a rapid fall in price following the stimulus to wider production. Mr. Arthur Linz, chemical engineer with the Climax Molybdenum Co., has quoted figures in the American technical Press recently* showing that U.S. chemical consumption of molybdenum has risen from 100,000 lb. in 1935 to 500,000 lb. in 1940.

At present its largest chemical field of application is in the production of pigments for printing inks, lacquers, paints, and other pigment-consuming products. The principal pigments involving the use of molybdenum are the precipitated basic dyestuffs of the triphenylmethane series (*e.g.*, peacock blue, brilliant green) and molybdenum orange. The latter is a solid solution formed by co-precipitation of basic lead molybdate and basic lead chromate with other slightly soluble lead salts. It approximates to the composition $PbMoO_4$, $PbO$, $H_2O$ + $PbCrO$, $PbO$. Molybdenum colours are noted for their permanence, brilliance and great tinting strength.

The first observation of the formation of molybdenum orange was in 1863, but it was not until 1930 that it was introduced for commercial use. The precipitated dyes were first discovered in 1912, at which time it was found that the addition of acid salts of either tungsten or molybdenum or combinations of the two produced desirable pigments, with permanence as well as brilliance. At that time molybdenum was so much higher in price than tungsten, that colours with tungsten alone were produced and the pigments became known as tungstated toners or tungsten lakes. As molybdenum is now considerably cheaper than tungsten, molybdated toners are the economical choice.

## Use as a Catalyst

This application is followed closely in volume by the use of molybdenum as a catalyst. Although in this field there are a great many patents that include molybdenum, very little information is available to show precisely how it is applied. It is used by the petroleum industry and is valuable in the production of high-grade motor spirit. Molybdenum is likewise utilised in bright zinc plating and for the production of a black finish by electrodeposition, known as "Moly Black," which, chemically, is mainly molybdenum sesquioxide. In ceramics, molybdenum is gradually coming into its own as an adherence-promoting agent in connection with the glass enamelling of steel and iron. The pale colour of its compounds is of special interest in this field. For dyeing furs it is used in conjunction with organic compounds to produce a variety of permanent colours.

Miscellaneous outlets for molybdenum metal are found in industries where its high melting-point, over 2600° C., is of value. For example, it may be used as a "heater winder" on hydrogen furnaces, where its life is much longer than that of any other available material. It also provides leads or electrical connections through the walls of glass vessels or bars, as it may be sealed directly to certain grades of hard glass. Its high ductility makes it a convenient material for the fabrication of vessels used in handling materials to be heat-treated in high-temperature hydrogen furnaces, up to 1200° C. Molybdenum welds readily to other metals such as copper and nickel, and, while it is not so easily welded to itself, the welding can be accomplished with reasonable care. Finally, it is an important material in the radio industry, as the majority of good quality receiving tubes contain molybdenum, although cheaper substitutes are often employed.

* Chem. Ind., 1941., *48*, 5, 573.

# Personal Notes

BARON CHERWELL, of Oxford in the County of Oxford, is the title chosen by Professor F. A. Lindemann, who was created a baron in the last civil list of birthday honours.

MAJOR-GENERAL WILLIAM N. PORTER is the new chief of the United States Chemical Warfare Service, filling the vacancy caused by the retirement of Major-General Walter C. Baker.

MR. R. BELCHER, A.I.C., Research Chemist of the Safety in Mines Research Board, has received a Leverhulme Research Grant for the purpose of studying the chemical constitution of coal by means of electrolytic oxidation.

MR. GEOFFREY CUNLIFFE has joined the Industrial and Export Council as a business member. He relinquishes his post as Aluminium Controller, Ministry of Aircraft Production, but will be available for consultation.

MR. J. W. PEERS, of Runcorn, an employee at the Castner Kellner works, has been awarded the certificate and bronze medal of the Liverpool Shipwreck and Humane Society together with £2. He saved three brothers whose raft capsized when sailing on a pit.

PROFESSOR CHARLES OLDEN BANNISTER, M.Eng. A.R.S.M., F.I.C., at one time chairman of the Liverpool Section of the Society of Chemical Industry, is about to retire from the chair of metallurgy at Liverpool University which he has held for 21 years.

SIR CHANDRASEKHARA VENKATA RAMAN, F.R.S., LL.D. D.Sc., director of the Indian Institute of Science, Bangalore, has been presented with the Franklin Medal and Certificate of Honorary Membership. It was received by Sir Gerald Campbell at the British Embassy at Washington.

MR. STANLEY R. C. HUGHES, of Widnes, has had the degree of B.Sc., with first-class honours in chemistry, conferred upon him by Liverpool University. The University Senate has also awarded him the Charles Bretherton Scholarship for chemical research, valued at £150 a year, tenable for two years, and the Leblanc Medal.

SIR JAMES IRVINE, C.B.E., F.R.S., D.Sc., LL.D., Principal and Vice-Chancellor of St. Andrew's University, who is well known for his important and successful experiments with sugar substances, has been presented by the Royal Society of Edinburgh with the Gunning Victoria Jubilee Prize, the Society's most important award, for his distinguished contributions to organic chemistry.

MR. FREDERICK ELLINGTON, B.Sc., A.R.C.S., F.I.C., of Elborne and Ellington, analysts and consulting chemists, Peterborough, has relinquished his interest in the practice owing to a Government appointment. MR. THOMAS MCLACHLAN, F.I.C., the remaining partner, will run the firm in conjunction with his laboratory at 17 Bloomsbury Square, W.C.1. MR. F. A. LYNE, B.Sc., F.I.C., will continue in charge at Peterborough.

MR. P. GUTHLAC JONES, until a few years ago chemist in charge of the Board of Trade dyestuffs testing laboratory in Manchester, has been appointed in a part-time capacity to succeed the late Mr. C. H. Heap as makers' Technical Adviser, makers' Technical Representative on the Joint Technical Committee of the Association of British Chemical Manufacturers and Colour Users' Association, and Secretary of the Dyestuffs Group of the Association of British Chemical Manufacturers.

# New Control Orders

## Control of Potash Soap

A DIRECTION appended to the Control of Caustic Potash and Carbonate of Potash (No. 3) Order, 1941 (quoted in our last issue, p. 32), provides for certificates issued by certain approved Associations to be accepted in place of licences issued by the Ministry for the purchase and use of caustic potash and carbonate of potash. These Association are: The Association of British Chemical Manufacturers; The British Flint Glass Manufacturers' Association; The Glass Manufacturers' Federation; and The Soap Makers' and Fat Splitters' Federation.

# British Chemical Prices

## Market Reports

AN active trade is reported from nearly all sections of the general chemicals market, and the movement into consumption both in respect of deliveries under existing contracts and fresh business has been fairly substantial. Quotations throughout the market are firm, and there is a strong tendency towards higher levels. Amongst the soda products items such as sodium chlorate, sodium nitrite and sodium hyposulphite are firm and on good demand, and there is a continued scarcity of supplies of yellow prussiate of soda. In the acid section, offers of citric and tartaric are below current requirements, whilst acetic acid, boric acid and oxalic acid are receiving a steady inquiry. There is little change to report in the position of the potash products, and available supplies continue to be reserved for priority requirements. The price position throughout the market for coal tar products shows no important change on the week and quoted rates are steady at recent levels. A fairly active demand is maintained in most sections of the market with carbolic acid and cresylic acid enoying an active inquiry. A moderate interest continues to be shown in pyridine, and there is a fair call for xylol.

MANCHESTER.—A firm range of values continues to be indicated for all descriptions of chemicals on the Manchester market. Textile bleaching, dyeing and finishing chemicals are being absorbed in fair quantities against contracts, whilst sellers on this market are also experiencing a steady flow of specifications from most of the other chief using trades. Additions to order-books in chemicals during the past few days have been on a fair scale for home consumption as well as for export. The tar products are firm throughout the range and supplies are being called for steadily against old contracts, with near delivery parcels difficult to secure in most materials.

GLASGOW.—Business in the Scottish heavy chemical trade still keeps steady with day to day transactions. Export inquiries are rather quiet again. Prices remain very firm.

## Price Changes

**Aluminium Sulphate.**—£10 5s. per ton, d/d.

**Ammonium Carbonate.**—£32 to £39 per ton, d/d in 5 cwt. casks.

**Arsenic.**—99/100%, £35 per ton, ex store.

**Carbolic Acid.**—Crystals, 9½d. to 10¾d. per lb.; Crude 60's, 3s. 3d. to 4s. 6d., according to specification. MANCHESTER: Crystals, 10½d. per lb., d/d; Crude, 3s. 10d. to 4s., naked at works.

**Lead Acetate.**—White, £48 to £52 ton lots. MANCHESTER: £46 to £48 per ton.

**Litharge.**—1 to 2 tons, £43 per ton.

**Magnesite.**—Calcined, in bags, ex works, £18 15s. to £22 15s. per ton.

**Methylated Spirit.**—Industrial 66 O.P., 100 gals., 2s. 4d. per gal.; pyridinised 64 O.P., 100 gals., 2s. 5d. per gal.

**Naphtha.** Solvent, 90/160°, 2s. 4d. to 2s. 8d. per gal.; heavy, 90/190°, 1s. 10½d., naked at works. MANCHESTER: 90/160°, 2s. 4d. to 2s. 8d.

**Potassium Nitrate.**—Small granular crystals, £40 to £45 per ton, ex store, according to quantity, nominal.

**Potassium Prussiate.**—Yellow, about 1s. 9d. to 1s. 11d. per lb., supplies scarce.

**Pyridine.**—90/140°, 18s. per gal.; 90/160°, 14s.; 90/180°, 4s. to 5s. per gal., f.o.b. MANCHESTER: 14s. to 18s. per gal.

**Sodium Chlorate.**—£36 to £45 per ton, d/d, according to quantity.

**Sodium Hyposulphite.**—Pea crystals, £19 15s. per ton for 2-ton lots; commercial, £14 15s. per ton. MANCHESTER: commercial, £14 10s.; photographic, £19 15s.

**Sodium Metasilicate.**—£14 15s. per ton, d/d U.K., in cwt. bags.

**Sodium Nitrate.**—£24 10s. per ton for ton lots.

**Sodium Phosphate.**—Di-sodium, £17 per ton d/d for ton lots.; Tri-rodium, £22 per ton d/d for ton lots.

**Sodium Silicate.**—£9 15s. per ton for 4-ton lots.

**Tartaric Acid.**—3s. 1d. to 3s. 3½d. per lb.; less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 3s. 0½d. per lb.

**Vermilion.**—Pale or deep, 13s. per lb. for 30-lb. bags, plus 5% War charge.

**Zinc Sulphate.**—Tech., about £20 per ton, carriage paid, casks free.

## Oil Prices

**Rosin.**—Nominal, supplies scarce.

**Turpentine.**—Spot, American, LONDON: 68s. 6d. per cwt. LIVERPOOL: 70s. per cwt.

# Inventions in the Chemical Industry

**The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.**

## Applications for Patents

Synthetic resin adhesives.—Aero Research, Ltd., and C. A. A. Rayner. (Sept. 24, '40.) 7672.

Synthesis of aromatic and heterocyclic amino-alkylamines. E. Bergmann. (Nov. 14, '40.) 7563, 7564.

Manufacture of dextrose.—A. E. Berry. 7520, 7521.

Manufacture of brewing products.—A. E. Berry. 7624.

Manufacture of varnishes, etc.—H. V. A. Briscoe. 7548.

Methods of preventing intergranular oxidation in ternary beryllium alloys.—British Thomson-Houston Co., Ltd. (United States, June 14, '40.) 7430.

Calenders, and process for making sheets from plastic compositions.—Carbide and Carbon Chemicals Corporation. (United States, July 18, '40.) 7585.

Manufacture of organic acids.—J. W. C. Crawford and Imperial Chemical Industries, Ltd. 7480.

Distillation apparatus and process.—Distillation Products, Inc. (United States, June 18, '40.) 7587.

Manufacture of acetic acid.—Distillers Co., Ltd., H. P. Staudinger, K. H. W. Tuerck, and E. H. Britain. 7669.

Protein-containing materials and their applications.—E. I. du Pont de Nemours and Co. (United States, June 14, '40.) 7606.

Manufacture of red oxide of iron, etc.—A. J. Evans. 7581.

Production, etc., of resinous materials.—D. Gonda. (Dec. 27, '39. 7456.

Apparatus for removal of sulphuric acid from concentration pots.—R. M. Green. 7582.

Exothermic chemical processes.—W. H. Groombridge and R. Page. 7485.

Azo derivatives.—N. H. Haddock and Imperial Chemical Industries, Ltd. 7602.

## Complete Specifications Open to Public Inspection

Production of fumaric acid.—C. Pfizer and Co. Dec. 7, 1939. 6213/40.

Compounds containing an active methylene group, and processes of preparing the same.—Merck and Co., Inc. Dec. 16, 1939. 12781/40.

Polyester resins.—American Cyanamid Co. Dec. 13, 1939. 13350/40.

Preparation of tetra-acylated ribonyl derivatives.—C. Pfizer and Co. Dec. 16, 1939. 16712/40.

Nitrogen-generating chemicals.—United States Rubber Co. Dec. 13, 1939. 16731/40.

Manufacture of urea-formaldehyde resinous composition.—E. I. du Pont de Nemours and Co. Dec. 8, 1939. 17361/40.

Process of treating animal fibres and the like with quaternary cyclic compounds.—J. R. Geigy A.-G. Dec. 11, 1939. 17498/40.

Magnesium silicate pigments and coating compositions containing the same.—E. I. du Pont de Nemour and Co. Dec. 12, 1939. 17541/40.

Dry distillation of materials in plate, slab, slate, or like form.—Aktiebolaget Industrimetoder. Dec. 1, 1939. 17617/40.

Process for the production of halogen-substituted acyl amino sulphonic acids, and the resulting products.—J. R. Geigy A.-G. Dec. 14, 1939. 17642/40.

Vulcanisation of rubber.—E. I. du Pont de Nemours and Co. Dec. 15, 1939. 17647/40.

## Complete Specifications Accepted

Emulsifiers.—H. C. Lundsgaard. Dec. 8, 1938. 537,211.

Selenium rectifiers, and method of producing the same.—Nurnberger Schraubenfabrik Ges. June 1, 1939. 537,251.

Method of and appartus for producing sodium bicarbonate in the ammonia-soda process.—A. M. Oswald. July 18, 1939. 537,252.

Preparation of organic sulphonates.—Colgate-Palmolive-Peet Co. Sept. 17, 1938. 537,255.

Alloys, and method of making same.—Battelle Memorial Institute. Sept. 21, 1938. 537,257.

Electric furnaces for metallurgical purposes.—Allmanna Svenska Elektriska A/B. Oct. 3, 1938. (Addition to 499,437.) 537,216.

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Separation of solids from liquids.—Briggs Clarifier Co. Oct. 28, 1938. 537,220.

Manufacture of condensation products.—Soc. of Chemical Industry in Basle. Oct. 14, 1938. (Cognate applications, 27972/39, 27973/39, 27974/39, 27975/39, and 27976/39.) 537,221.

Adhesives.—British Industrial Plastics, Ltd., and A. Brookes. Nov. 6, 1939. 537,176.

# Silver Solder

## Revised British Standard

THE British Standards Institution has recently undertaken the revision of B.S. 206, Silver Solder, Grades A, B and C, to include a further type of solder of the quaternary alloy class (*i.e.*, containing silver, copper, zinc and cadmium), which is now being increasingly used in industry. An appendix has been included for general information, which gives the melting range of the three grades of solder that are now covered by this specification, copies of which will shortly be obtainable from the British Standards Institution, price 2s. net (2s. 3d. post free).

## HYDROCHLORIC ACID PLANT

THE THERMAL SYNDICATE, LTD., Wallsend, Northumberland, have published a brochure devoted to Vitreosil hydrochloric acid plant. The rigorous conditions attending the production of hydrochloric acid, either by heating together salt and sulphuric acid or by the synthetic process using hydrogen and chlorine from the electrolysis of brine, call for the most perfect equipment. The makers of Vitreosil pure fused silica claim that their product is eminently suited to the part, since it can be used at all temperatures up to 1100° C. and is completely resistant to all forms of chemical attack. Moreover fused silica is essential if pure acid, free from arsenic, selenium, and compounds of iron and chlorine, is to be produced. Another good quality of the Vitreosil "S" type absorber is its light weight and the small ground area which it occupies. Throughout, the booklet is fully illustrated with diagrams and pictures of various plants and vessels.

## LETTER TO THE EDITOR

### Absorptiometer

SIR,—It may be remembered that last year we were appointed by Messrs. Adam Hilger, Ltd., to be distributors of the Spekker Steeloscope manufactured by them for the rapid qualitative analysis of steel. We now are pleased to advise you of an extension of our arrangements with them in connection with the Spekker Photoelectric Absorptiometer, of which we have been appointed sole distributors in the United Kingdom, to the engineering and metallurgical industries.

The Spekker Photoelectric Absorptiometer is an instrument for chemical analysis by colorimetric methods and possesses many advantages over visual colorimeters. For example, measurements are entirely independent of the visual judgment of the observer, while except for initial calibrations of the instrument, no standard solutions are necessary. Colorimetric tests by the Spekker Absorptiometer can be carried out for practically all metals, and provide very rapid yet accurate quantitative means of analysis. Further, if preliminary tests on ferrous materials are carried out on the Steeloscope which gives qualitative results, much time can be saved in arriving at an accurate analysis which might otherwise take very much longer by ordinary methods of analysis.

We shall shortly have a demonstration Absorptiometer in our research department and, having already a Spekker Steeloscope, we shall be able to demonstrate to interested parties the individual and combined uses and advantages of the two instruments.—Yours faithfully,

WILD-BARFIELD ELECTRIC FURNACES, LTD.,
J. E. ORAM,
Director.

Watford, Herts.
July 17, 1941.

# General News

**Imperial Chemical Industries, Ltd.**, have contributed £2000 to the Midlothian War Weapons Week.

**"Ventilation in the Black-out,"** in a revised edition, has been published by the Ministry of Home Security, price 1d. (post free, 2d.).

**The present rate of collection** of the Red Cross Penny-a-week Fund averages £19,000 a week; the total raised since the fund was started in November, 1939, now exceeds £860,000.

**The price of pool bitumen** has been increased by 28s. per ton from July 10, according to an announcement of the Petroleum Board.

**The Ministry of Supply** announces that applications for authorisations for the purchase of steel for hand tools should henceforth be addressed to the Directorate of Hand Tools, The Cedars, Tettenhall, Wolverhampton. The definition of a hand tool for this purpose is a "tool operated by hand not requiring mechanical power to drive it."

**The Welsh Highland Railway**, which runs from Portmadoc to Dinas Junction in Caernarvonshire (28 miles), has been purchased for dismantling by George Cohen & Sons, Ltd. In consequence some 1200 tons of relayable rails and a considerable tonnage of scrap metal will become available for the national war effort.

**United Kingdom firms** who desire to apply to the Department of Overseas Trade for recommendation in support of applications for exit permits for commercial journeys abroad should in future communicate with the Department of Overseas Trade, I.C.I. House, Millbank, London, S.W.1. (Tel.: WHItehall 9040.).

**The Trading with the Enemy** (Specified Persons) (Amendment) (No. 10) Order, issued by the Board of Trade and coming into operation on July 10, contains about 200 additions to and 50 deletions from the list, in previous similar orders, of persons with whom trading is illegal. Additions of chemical interest include: Laboratorio Zambeletti, Ltda., Rua Alluquerque Lins 480, Caixa Postal 2069, S. Paulo, Brazil; Industria Quimica Colombiana S.A. (Iquico), Calle 59, Medellín, Colombia; Resinagem Nacional, Ltda., Alcobaça, Portugal; Schering Nordiska A/B, Wahrendorffsgatan 6, Stockholm, and Svenska Instrument A/B, Sveavägen 21-23, Stockholm, Sweden; and Hevaloid A.G., Talstrasse 15, Zurich, Switzerland.

## Foreign News

**The 102nd meeting of the American Chemical Society** will be held at Atlantic City, New Jersey, from September 8 to 12.

**Information has been received in London** that Chile expects to export three or four tons of quicksilver a month, starting in October.

**The Government of the Netherlands Indies** are planning the establishment of a soda-ash factory. Six million guilders is the figure given for the capital required.

**Plans have recently been approved** for the construction of Switzerland's first wood-saccharification plant in the Canton of Grisons.

**Spain is said to be** experiencing a shortage of fungicides and insecticides, copper sulphate imports from December, 1940, to March, 1941, inclusive, being not more than 1500 metric tons. The normal annual imports are about 18,000 tons.

**Commercial fertiliser consumption** in the United States set up a record when 8,311,000 tons was used last year. This is the highest total ever reached and, it is reported, represents a gain of more than 500,000 tons over the previous year.

**The first meeting** of the Brazilian Chemical Association is scheduled to be held at Sao Paulo from July 21 to 26. A large number of papers on sugar and alcohol analysis and on rubber are expected.

**Production of synthetic ammonia** for explosives manufacture will soon begin in a new plant at Wilson Dam, near Sheffield, Alabama. Production will be about 20,000,000 cu. ft. of gas a day from coke, steam, and air. It will provide the elements from which other equipment will create the synthetic ammonia. The amount of ammonia or the quantity of explosives to be produced is not revealed.

# From Week to Week

**Exports from Southern Rhodesia** of drugs, chemicals, etc., in March, 1941, were valued at £15,731, compared with £361 in March, 1940. Imports of chemicals rose from £36,428 in March last year to £63,361 in the corresponding month this year.

**U.S. exports of calcium carbide** were 17,700,000 lb., valued at $649,000 in the first quarter of 1941. The majority of this large quantity was shipped to England and Argentina, with smaller quantities being sent to almost all Central and South American countries.

**Deliveries of copper** to consumers in the United States for June are reported to amount to 115,097 tons. This is a reduction of 26,704 tons from the peak figure of 141,801 tons set up in May. The June figure includes 31,667 tons of copper from Latin-America compared with 49,190 tons in the previous month. Export shipments during June amounted to 42 tons.

**H.M. Ambassador at Santiago** reports by telegraph that the United Kingdom and Chilean Governments have agreed to continue to extend to the commerce of the two countries for a further period of twelve months from July 1, 1941, most-favoured nation treatment as provided in the Anglo-Chilean *modus vivendi* of October 15, 1931.

**A certain Dr. Posse**, it is reported by a Dutch correspondent of *The Times*, has been appointed by Goering (acting as plenipotentiary for the Nazi "Four-Year" Plan) to be Reich commissioner for combining the business control of the Lever Brothers and Unilever concerns and their branches on the Continent. The decree, which came into force on July 9, makes the reservation that the powers of the Reich commissioner of the Unilever concern in the occupied Netherlands will be vested in a German executive appointed by him.

**According to the Bureau of Mines**, the domestic production of mercury in the United States during April amounted to 3500 flasks, the same as for March, and 5 per cent. below the high output established in December, 1940. The consumption declined from 4000 flasks in March and 4700 in February to 3200 in April. Consumers' and dealers' stocks at the end of April increased to 11,700 flasks from 11,600 on hand at the end of March. At the April rate of use these stocks were equivalent to almost four months' requirements.

**The production of sulphuric acid** in Japan during 1940 fell to approximately 30 per cent. below the total capacity of the industry. This was partly due to lack of power, but the damage by fire to the Matsuo Sulphur Mine is equally important. Several new plants for the manufacture of sulphuric acid were erected during the past year; the most important is reported to have a monthly capacity of 3000 tons. The plan for the total annual output of the industry is said to be 1,000,000 metric tons, some 1,200,000 tons more than the 1938 production.

**Preliminary statistics for 1940** place the Canadian output value of chemicals and allied products at $184,152,867 or 15 per cent. more than in 1939, the Dominion Bureau of Statistics reports. About 56 per cent. of the production was from Ontario with 423 establishments and output valued at $102,968,951. Quebec, with 247 factories and production worth $58,642,339, accounted for 32 per cent., and British Columbia with 50 plants and output at $11,225,864 accounted for 6 per cent. of the total. New records were established in 1940 for both imports and exports of chemicals and allied products. Imports rose 18.6 per cent. to $51,824,059, of which $41,500,000 were supplied by the United States and $7,500,000 by the United Kingdom. Exports increased 26.7 per cent. to $31,222,806.

# Forthcoming Events

**The first of the post-graduate lectures** on Inorganic Chemistry, arranged by the Oil and Colour Chemists' Association will be delivered by Professor H. J. Emeléus on July 24 at 7 p.m., in the Chemistry Lecture Theatre, Imperial College of Science, London, S.W.7. His subject will be "The Structure of Inorganic Molecules." The second, by the same lecturer, will be "The Technique of Inorganic Chemistry," at the same hour and place, on July 31. A fee of 5s. is charged, and non-members of the O.C.C.A. must be introduced by a member.

# Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

### Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

WATCO, LTD., London, S.W., wood preservative manufacturers, etc. (M., 19/7/41.) June 20. £1000 (not ex.) 2nd debenture, to J. F. Bradford, London, general charge. *£300. August 22, 1940.

### Satisfaction

WATCO, LTD., London, S.W., wood preservative manufacturers, etc. (M.S., 19/7/41.) Satisfaction, June 20, of debentures registered May 19, 1939, to the extent of £25.

### County Court Judgment

LESLIE GLASS WORKS, LTD., 16 St. James Park, Croydon, Surrey. (C.C.J., 19/7/41.) £12 4s. 5d. May 1.

### Company Winding-Up Voluntarily

CASSEL CYANIDE CO., LTD. (C.W.U.V., 19/7/41.) By special resolution, June 30. R. J. Walker, Billingham South, Durham, appointed liquidator.

VICTOR COMPOSITION CO., LTD. (C.W.U.V., 19/7/41.) That the company be wound up, and that E. A. Hill, Esq., A.C.P.A., 159 Essex Road, Islington, London, N.1., be appointed the liquidator.

# Company News

**British Glues and Chemicals, Ltd.**, announce a profit for the year of £101,969 (£113,347) after provision for E.P.T.

**The Clover Paint and Composition Co., Ltd.**, announce an interim dividend of 3½ per cent., making 6 per cent. (same) for year.

**George Kent, Ltd.**, have declared a final dividend of 7 per cent., plus a bonus of 2½ per cent., making 12½ per cent. (9 per cent.) for the year to March 31.

**Crosfield Oil and Cake Co., Ltd.**, announce a net profit for year to March 31 of £15,631 (£19,547), and a dividend of 15 per cent., and bonus 5 per cent. (same).

The directors of the **Midland Bank, Ltd.**, announce an interim dividend, for the half-year ended June 30, of 8 per cent. actual, less tax, payable on July 15 (same).

**The Electrolytic Zinc Co.** of Australasia has declared a dividend of 8 per cent. on the preference and ordinary shares, making 14 per cent., for the year ended June 30.

**The Burmah Oil Company** announce a net profit for the year of £2,676,848 (£3,623,719). Dividends totalling 15 per cent. have already been paid, but no bonus is recommended.

**Thomas Bolton and Sons, Ltd.**, announce a trading profit for year to March 31 of £161,852 (£183,621), and have declared a final dividend of 5 per cent., making 7½ per cent. (10 per cent.).

**The Standard Chemical Co., Ltd.**, of Canada, announce a net profit for the year to March 31 of $54,921 ($57,330), and have declared a final dividend of 75 cents, making 1.25 cents (50 cents).

**English China Clays, Ltd.**, announce no preference dividend for 6 months to June 30, but dividend of 1¾ per cent. for 3 months to March 31, 1941. Further consideration of preference and ordinary dividends is postponed until end of financial year.

The consolidated profits of the **British Plaster Board Co.**, and its subsidiaries, for the year to March 31, amount to £563,303 (£514,588), less tax. The dividend on the doubled ordinary capital, resulting from the capital bonus of 100 per cent., is brought up to 15 per cent. by the declaration of a final dividend of 10 per cent.

**Van den Berghs & Jurgens, Ltd.**, and the **Niger Company**, both subsidiaries of **Lever Bros. & Unilever, Ltd.**, announce profits for the past year of £1,065,982 (£1,066,027) and £518,859 (£1,076,784) respectively. Van den Berghs have declared an ordinary dividend of 10 per cent., tax free (12½ per cent.), while the Niger Company's dividend is reduced from 6 per cent. to 4 per cent., tax free.

# New Companies Registered

**E. G. H. Laboratories, Ltd.** (368,052).—Private company. Capital, £100 in 100 shares of £1 each. Manufacturers of and dealers in chemicals, medicinal, industrial, agricultural and other preparations, toilet products, etc. Directors: Cecil B. Green, Walter S. Harris, and Alfred H. Fennall. Registered office: Peru Street, Adelphi, Salford, Manchester.

**Safety Storage Systems, Ltd.** (368,020).—Private company. Capital, £100 in 800 shares of 2s. 6d. each. Manufacturers of and dealers in electrical, air, compressor, rotary, vacuum, gravity, or other pumps, receptacles for storage of solids or liquids, furnaces, fuel, chemicals, manures, etc. Directors: G. A. S. Harvey, Harry Budd, Harold Shand. Secretary: E. H. Nixon. Registered office: 58 Victoria Street, S.W.1.

# Chemical and Allied Stocks and Shares

FOLLOWING the recent upward movement in security values, less active and slightly reactionary conditions have ruled in most sections of the Stock Exchange. Nevertheless, all but a small part of recent gains has been held, and the general undertone of markets remained firm, aided by the more hopeful views which remain current in regard to the war and international developments. The recent upward trend in values has had the effect of reducing the margin between the yields on gilt-edged stocks and leading industrial securities. It is, of course, expected that demand will continue to centre on gilt-edged stocks, but recent trends on the Stock Exchange have provided a further indication of the tendency for yields on all classes of securities to be governed by the return on British Funds. Leading industrials have continued to be held firmly, and it is apparent that there is general willingness to be prepared to take the long view, despite the possibility that, in numerous directions, the weight of taxation and other factors will make reduced dividends inevitable in respect of the current year.

In accordance with the general market trend, shares of chemical and kindred companies have not fully maintained best prices recorded in the past few days, but in most instances they were only moderately lower on balance. For instance, Imperial Chemical, which are 32s. 9d. at the time of writing, are within 6d. of the price ruling a week ago, and Lever & Unilever at 25s. are virtually unchanged. British Aluminium at 44s. 9d. were 1s. 3d. higher on balance, while elsewhere, Barry & Staines have further improved from 28s. to 28s. 9d., and although "ex" the interim dividend, Nairn & Greenwich were higher at 56s. 3d. Moreover, on balance, Wall Paper Manufacturers deferred units have moved up to 24s. at the time of writing, which compares with 23s. a week ago, and Pinchin Johnson were slightly higher at 21s. 3d. Awaiting the interim dividend, Associated Cement have been firm at 55s., and British Cement shares moved up to 80s. Following publication of the full report and accounts, British Plaster Board remained active and were quoted at 16s. 3d. Market hopes of improved results were reflected by further improvement in Imperial Smelting shares to 10s. 3d., and in other directions, Allied Ironfounders were again higher at 18s. In response to the prevailing belief that the dividend is likely to be maintained, Tube Investments were higher at 94s. 6d., and Stewarts & Lloyds have had a very firm appearance at 55s. Staveley shares were 48s. 6d., and United Steel 24s.

British Glues issues remained firm on the full results. The 4s. ordinary shares, whose dividend is kept at 10 per cent., were quoted at 5s., and the £1 participating preference, whose distribution is again 9 per cent., were 28s. 9d. Business at 22s. 9d. has been recorded in Monsanto Chemicals 5½ per cent. preference, and elsewhere, Greeff-Chemicals Holdings have transferred at 4s. 7½d. Among smaller-priced shares, Benzol and By-Products showed dealings at 1s. 3d., and British Industrial Plastics have changed hands up to 2s. 9d. Aided by the strong finances again shown by the accounts, Morgan Crucible preference shares remained firm; the 5½ per cent. first preference have been dealt in up to 23s. In other directions, Fison Packard were again 32s. 6d., while B. Laporte were around 61s. Forster's Glass shares have transferred up to the higher level of 17s. 6d., and United Glass Bottle were 52s. 6d. A firm feature was provided by British Match at 34s. 3d., and by British Oxygen at 66s. 10½d. Boots Drug have moved higher to 37s., and Beechams Pills 2s. 6d. deferred shares made the increased price of 8s. 4½d. On the other hand, British Oil & Cake Mills preferred ordinary had an easier appearance at 40s. 3d. In response to the Syrian news, Anglo-Iranian and Burmah Oil shares showed improvement, although best prices recorded in the past few days were not fully held. Anglo-Egyptian Oilfields "B" shares were again higher on balance.